PIPE FITTING FRICTION CALCULATION

The friction loss for fittings depends on a K factor which can be found in many sources such as the Cameron Hydraulic data book or the Hydraulic Institute Engineering data book, the charts which I reproduce here in Figures 1 and 2.

The fittings friction $\Delta H_{FF}$ can be calculated based on the following formula where $K$ is a factor based on the type of fitting, $v$ is the velocity in feet/second, $g$ is the acceleration due to gravity \((32.17 \text{ ft/s}^2)\).

$$\Delta H_{FF} (\text{ft fluid}) = K \frac{v^2 (\text{ft/s})^2}{2g (\text{ft/s}^2)}$$

For example a 2 ½” inch screwed elbow has a K factor of 0.85 according to Figure 1 and using a velocity of 10 ft/s (this is determined from the flow rate). The fittings friction loss will be:

$$\Delta H_{FF} (\text{ft fluid}) = 0.85 \frac{10}{2 \times 32.17^2} = 1.3$$
Figure 1 Pressure head loss K coefficients for fittings (source the Hydraulic Institute Standards book www.pumps.org).
Figure 2 Pressure head loss K coefficients for manual valves and other devices (source the Hydraulic Institute Standards book www.pumps.org).